



Radio Frequency Exposure Evaluation Report

FOR:

Apple Inc.

Model Name:

A1843

Product Description:
Wireless keyboard

FCC ID: BCGA1843
ISED ID: 579C-A1843

Applied Rules and Standards:
CFR 47 Part 2.1093
FCC KDB 447498 D01 General RF Exposure Guidance v06

Test Report #: SAR-APPLE-195-17002-FCC-SAR-EX

DATE: 2017-05-16



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1. Assessment

The following device was evaluated against the limits for general population uncontrolled exposure specified in CFR 47 Part 2.1093 according to SAR evaluation exclusion requirements specified in FCC regulation as listed in KDB 447498.

The device meets the requirements for SAR exclusion as stipulated by the above given FCC rules.

Company	Description	Model #
Apple Inc.	Wireless keyboard	A1843

Responsible for Testing Laboratory:

2017-05-16	Compliance	Peter Nevermann (Director RC&E)	
Date	Section	Name	Signature

Responsible for the Report:

2017-05-16	Compliance	James Donnellan (Sr. EMC Test Engineer)	
Date	Section	Name	Signature

The test results of this test report relate exclusively to the test item specified in Section 3. CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM Inc. USA.

2. Administrative Data

2.1. Identification of the Testing Laboratory Issuing the Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
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Telephone:	+1 (408) 586 6200
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Director Radio Communications and EMC	Peter Nevermann
Responsible Project Manager	James Donnellan

2.2. Identification of the Client

Applicant's Name:	Apple Inc.
Street Address:	1 Infinite Loop
City/Zip Code	Cupertino, CA 95014
Country	USA

2.3. Identification of the Manufacturer

Applicant's Name:	Apple Inc.
Street Address:	1 Infinite Loop
City/Zip Code	Cupertino, CA 95014
Country	USA

3. Equipment under Assessment

Model No	A1843
HW Version	Rev. 01
SW Version	0X0822
FCC-ID	BCGA1843
IC ID	579C-A1843
Product Description	Wireless Keyboard
Device Category	<input type="checkbox"/> Fixed Installation <input type="checkbox"/> Mobile <input checked="" type="checkbox"/> Portable <input type="checkbox"/> Mixed Mobile and Portable
Frequency Range / number of channels	2402 MHz (Ch. 0) – 2480 (Ch.79), 80 channels for Bluetooth BDR/EDR 2402 MHz (Ch. 0) – 2480 (Ch.39), 40 channels for Bluetooth LE
Type(s) of Modulation	Bluetooth BDR/EDR with GFSK, $\pi/4$ DQPSK and 8PSK modulation. Bluetooth LE with GFSK modulation.
Modes of Operation	Bluetooth LE and Bluetooth BDR/EDR
Max. declared antenna gain	IFA Internal antenna: Antenna Gain: 5.5 dBi @ 2.4 GHz.
Minimum distance of antenna or radiating parts to user	5mm or less
Max. declared conducted output power including tune up	Maximum conducted power 7 dBm for BT BDR/EDR 4.5 dBm for BTLE
Max. measured conducted output power	6.97 dBm (RMS)
Power Supply/ Rated Operating Voltage Range	Internal Battery Vmin: 3.1 VDC / Vmax: 4.7 VDC
Operating Temperature Range	0 °C to 35 °C
Other Radios included in the device	N/A
Co-located Transmitters/ Antennas	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Sample Revision	<input checked="" type="checkbox"/> Prototype <input type="checkbox"/> Production <input type="checkbox"/> Pre-Production
Exposure Category	<input type="checkbox"/> Occupational/ Controlled <input checked="" type="checkbox"/> General Population/ Uncontrolled

4. FCC Exemption Limits for Routine Evaluation

4.1. FCC SAR test exclusions

FCC SAR Test exclusion are set by KDB 447498 General RF Exposure Guidance v06 Section: 4.3.1.
Standalone SAR test exclusion considerations

a) For 100 MHz to 6 GHz and test separation distances ≤ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:

$$\left[\frac{\text{(max. power of channel, including tune-up tolerance, mW)}}{\text{(min. test separation distance, mm)}} \cdot \sqrt{f(\text{GHz})} \right] \leq 3.0 \text{ for 1-g SAR, and } \leq 7.5 \text{ for 10-g extremity SAR, where}$$

- $f(\text{GHz})$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- The values 3.0 and 7.5 are referred to as *numeric thresholds* in step b) below

The test exclusions are applicable only when the minimum *test separation distance* is ≤ 50 mm, and for transmission frequencies between 100 MHz and 6 GHz. When the minimum *test separation distance* is < 5 mm, a distance of 5 mm according to 4.1 f) is applied to determine SAR test exclusion.

4.2. Stand-Alone SAR Evaluation Exclusion

According to KDB 447498, SAR evaluation can be excluded if the following equation is satisfied:

$$\left[\frac{\text{(max. power of channel, including tune-up tolerance, mW)}}{\text{(min. test separation distance, mm)}} \cdot \sqrt{f(\text{GHz})} \right] \leq 3.0$$

- The maximum RF channel power for the device under evaluation is 7 dBm Or 5.0 mW for Bluetooth BDR/EDR

Using the above equation for the worst case power of the BT radio:

$$\left[\frac{(5.0 \text{ mW})}{(5\text{mm})} \right] \cdot \sqrt{2.480} = 1.57$$

- The maximum RF channel power for the Bluetooth LE Radio is 4.5 dBm Or 2.8 mW.

Using the above equation for the worst case power of the BTLE radio:

$$\left[\frac{(2.8 \text{ mW})}{(5\text{mm})} \right] \cdot \sqrt{2.480} = 0.88$$

5. Conclusion:

- SAR testing for FCC is excluded for the Bluetooth BDR/EDR because the numeric thresholds of 1.57 is less than the 3.0 FCC limit for 1g SAR.
- SAR testing for FCC is excluded for Bluetooth LE because the numeric thresholds of 0.88 is less than the 3.0 FCC limit for 1g SAR.

6. Revision History

Date	Report Name	Changes to report	Report prepared by
2017-05-04	SAR-APPLE-195-17002-FCC-SAR-EX-Draft	Draft Version with updated Section 4.2	James Donnellan
2017-05-16	SAR-APPLE-195-17002-FCC-SAR-EX	Initial Release. Updated Product Description	James Donnellan